Work procedures, which are already necessary to assure adherence to the C95.1 standard, can continue to be used to effectively protect those who must occasionally work or be near high-power base station antenna installations.

The Commission questions whether it should require certification of the work procedures which each licensee uses at its radio sites to assure adherence to the C95.1 standard. TIA believes that a formal certification for each relevant site is unnecessary and would pose an administrative burden which would not be commensurate with the attendant benefit. The Commission should clearly articulate in its Rules that each licensee is fully responsible to establish those procedures that are necessary. It should enforce this requirement where appropriate, verifying on either a spot check or some other warranted basis that such procedures were in place.

With regard to mobile use, there has likewise been no change in either the ANSI standard or the equipment used since the Commission adopted its Rules in 1985. With respect to hand-held portable radios, however, the standards have been modified with respect to the low power exclusion above 450 MHz. For example at 900 MHz, only 3.5 watts is permitted in order to meet the low power exclusion; previously, 7 watts was permitted. This change is believed to be inconsequential, however, because existing hand-held portable radios in both the 800 MHz and the 900 MHz band have powers which are below the requirement of the 1992 ANSI standard. On the basis of the above discussion, TIA believes that the Commission has a sound rationale for again categorically excluding the services which fall within the controlled environment from environmental evaluation.

Let us now focus upon the Cellular Radio Service. First of all, it should be mentioned that base stations associated with cellular operation are properly categorized in the controlled environment. This is true because of the inaccessibility of these (and virtually all Land Mobile) sites to the public. These sites are normally located up on a tower, on a rooftop, or in the top floors of a building. For equipment security reasons, public access to such sites is usually quite rigorously controlled. Access is normally limited to service personnel, and occasionally to others who may have a need to be allowed in the area on a transitory basis. Therefore, cellular base stations should fall under the same C95.1 provisions as the Part 90 land mobile base stations discussed above.

Cellular mobile units, however, are subject to the limits associated with the uncontrolled environment. These limits are readily met in this case, however, because of the low power (maximum 3 watts) at which cellular mobile units operate. The geographic spacing required to meet the C95.1 standard, as elaborated in mobile user instruction manuals, is about ten centimeters for this power. It is highly unlikely that anyone would be within that distance of a mobile antenna at all, and certainly not for any significant period of time. Transportable units also operate at a power level of 3 watts. The just-described points also apply in this case.

Another element of cellular system operation, the hand-held portable radios, will also generally fall within the uncontrolled environment category. It is anticipated that the Commission may require, as a part of the equipment authorization procedure, that applicants indicate that they meet the low power device exclusion provision, either by virtue of measuring SAR, by being below a requisite power level, or other analysis. Thus, the Commission will have assurance that all cellular hand-held portable radios (and similar units used in the new Part 99) comply with the provisions of the C95.1 standard.

On the basis of the above discussion of cellular base stations, mobile units and hand-held portable radios, the Commission is warranted in providing a categorical exclusion for Part 22, and because of its similarity, the Part 99 service.

VI. Alternate Guidelines Should be Disregarded Since the IEEE C95.1 Report Intentionally Omitted the Modulation Restriction Suggested by NCRP.

The NPRM addresses the issue of exposure to electromagnetic fields with carrier frequencies which are modulated at a depth of 50 percent or greater at frequencies between 3 and 100 hertz.[14] The TIA has investigated this stipulation for providing specialized controls of EME when the RF field is pulse (modulated) and determined that the IEEE C95.1 Report has intentionally omitted this modulation restriction.

NCRP Report No. 86 "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields" has been considered and the TIA notes that in article 17.4.7 "Modulation", the NCRP Report discusses in detail the effects of radio-frequency electromagnetic ("RFEM") spectrum under low-frequency modulation on "in-vitro" and "in-vivo" preparations. Fundamentally, the NCRP Report No. 86 at 17.4.7 regarding the low frequency modulation states that:

> It is not known whether these effects pose a risk to health, but their reliability and their independent confirmation in avian and mammalian species dictate the need for caution. (Emphasis added.)

Significantly, the issue date of the NCRP Report No. 86 is April 2, 1986. This 1986 Report is then compared to the current version of IEEE C95.1 with its issue date of April 27, 1992.

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[14] See paragraph 25 of NPRM.

Six years have elapsed between the issuance of the NCRP No. 86 Report during which time any risks to health due to these low frequency RFEM's could have been identified. In this period since 1986, resolution of the caution has not only not been advanced, but TIA, upon investigation of the evolvement of the C95.1 document finds that this issue was actively considered in the development and drafting of the document. Furthermore, TIA understands that due to the lack of reliable scientific data which provides evidence of risk to human health, the inclusion of modulation as an IEEE C95.1 requirement for special limits/exposures was intentionally abandoned.

C95.1 is very clear on this modulation effect issue[15] and explicitly indicates the lack of evidence that modulation-specific test results were meaningfully related to human health. We therefore conclude that the lack of reliable scientific data led the C95.1 Subcommittee IV expert scientists to the specific rejection of consideration of effects of modulation on electromagnetic exposures as applied to C95.1. TIA concludes that while the actions in creation of the NCRP Report No. 86 were no doubt a proper exercise of prudent caution at that time in regards to the question of the effects of modulation, TIA holds that the industry and the FCC should embrace the benefits of the developments occurring in the last six years of research as well as the studies of the IEEE C95.1 Subcommittee IV.

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[15] See C95.1-1991, p. 23, Section 6.

These studies observed that within the safe exposure levels recommended by C95.1, no reliable scientific data exists which indicates that modulation of the EM field is a factor notably related to human health.

Additionally, TIA submits that the composition of the C95.1 committee represents the most competent of the expert scientists and bio-effects specialists in the world, with this group spending literally countless man-hours on the EME subject. Therefore, TIA contends that C95.1 is sufficient in itself on this modulation issue and we endorse it as the appropriate requirement. Since the omission of modulation effects on electromagnetic energy was intentional by this astute group of experts, TIA appeals to the FCC to embrace the current expert C95.1 opinions and dismiss the 1986 cautions on modulation indicated in the NPRM at paragraph 25 which, if enacted, would unduly restrict modulated signals without cause.

VII. Existing Equipment Should Be Grandfathered Indefinitely and New Portable Equipment Should be Required to Meet RF Emission Requirements Two Years After Approval of an Appropriate SAR Measurement Standard.

The Commission indicates in its Notice that compliance with the new C95.1 Standard may pose significant burdens upon some licensees. TIA agrees, and notes that it may also have a significant impact upon manufacturers. Thus, we wish to offer the following views and recommendations to assist the Commission in implementing a relatively smooth, but appropriate transition between its old (current) Rules and those which it may adopt as a result of this proceeding.

As discussed elsewhere in this filing, there is a substantial number of existing Land Mobile radio units in operation today. While the degree of compliance by these units to the C95.1 Standard is of importance, TIA asserts that the impeccable safety record on RF exposures in the land mobile industry is not a happenstance occurrence. Two factors are significant in maintaining this safety record; the information on safe-use contained in equipment manuals and secondly, the relatively low RF levels produced by Land Mobile equipment. This established record for safety demonstrates that Land Mobile equipment operates well below the threshold for harm to humans. Therefore, we recommend that all existing Land Mobile radio units be indefinitely grandfathered.

Notwithstanding the above, TIA has studiously determined that it may be necessary in some cases to measure the SAR of future portable units to assure compliance with C95.1. As a precedent to conducting these measurements, it will be necessary to first develop the requisite test procedures. As discussed elsewhere in this filing, TIA is willing to act as the focal point in development of these procedures, using its normal ANSI accredited standards setting process.

A period of time will be required after approval of the resultant SAR measurement standards for manufacturers and others to construct and validate the appropriate testing facilities. In addition, there must also be sufficient capacity available for those manufacturers who wish to use independent testing facilities. TIA estimates that an additional two-year period of time will be needed for appropriate test facilities to be available. Thus, we recommend that the effective date for compliance with the Rules for portable radio units be two years after competitive and commercially available SAR measurement laboratories are established. The competitive SAR measurement laboratories would be required to test to the FCC adopted measurement procedures.

The Commission seeks comment on the information that should be required to be submitted in conjunction with license applications and also the procedure to be used to establish compliance with SAR requirements. TIA recommends that the license application process remain unencumbered from additional and unnecessary C95.1 information. Additionally, for portable transmitter type acceptance applications, TIA recommends that SAR certification be completed as part of the type acceptance application.

Concerning type acceptance, TIA recommends that the applicant be required to provide only an affirmative indication (by, for example, checking an appropriate box) that the relevant parameters were measured or otherwise determined, and that the requirements of the Rules were, in fact, met. We believe that submission of specific, detailed information would place an administrative burden on both the Commission and the applicant without commensurate benefit. Rather, the Commission should use its prerogative to spot check, when appropriate, to verify the integrity of the process.

VIII. SPACINGS REQUIRED FROM TYPICAL LAND MOBILE BASE STATION INSTALLATIONS TO ASSURE ADHERENCE TO THE C95.1 STANDARD

In Appendix B of its Notice, the Commission provides discussion of and estimated guidelines for spacings which would be required to assure that people in the uncontrolled environment would not be subject to radiofrequency energy levels which exceed the C95.1 standard. These estimates were based upon "worst-case" considerations, and showed that vertical spacings of from 6 to 20 meters, depending on the power used, would be required.

TIA believes that the Commission's indicated spacings are significantly overstated, and thus provides the following analysis of typical base station installations. First of all, as stated elsewhere in this filing, TIA believes that virtually all Land Mobile installations will properly fall within the controlled environment category; we will therefore also include this category in our analysis.

Our analysis is based upon a 300 watt transmitter operating in the 150 MHz band. This band was chosen as it is represents reasonably well a worst case situation. The powers used in this band are among the highest used for land mobile communications. Also, the C95.1 standard is the most stringent in this portion of the radio spectrum. The spacings shown below were developed on the basis of ANSI measurement procedures and traditional engineering practice.

The calculation of the exact field strength and power density near an antenna is complex. One method to estimate the radiated power is based upon knowledge of the dipole radiation pattern and assuming a point source. Since Land Mobile base station antennas are vertically polarized, and are designed to emit most of their energy in the horizontal direction, there is relatively little energy emitted in the vertical direction. Typically, the energy emitted downward is 20 dB less than the energy emitted in the horizontal direction. The calculated spacing in the vertical (downward) direction from the end of a simple dipole antenna to meet the C95.1 standard for the uncontrolled environment is only about 20 centimeters (it would, of course, be even less for the controlled environment).

The separation distance in the horizontal direction will, of course be larger than in the vertical direction, and could vary somewhat with the type of antenna used. For the simple dipole antenna, the horizontal spacing required to meet the C95.1 standard for the uncontrolled environment is approximately 4 meters. For a 9 dB gain folded dipole array, the spacing is about 2 meters. Of greater relevance, however, the corresponding spacings for the controlled environment are 2 meters and 0.4 meters respectively.

An alternate calculation can be done based upon modeling the dipole as two point source radiators, one at each end of the dipole. This model is valid for half wave dipoles carrying a sinusiodal current. The total field can be calculated as the vector sum of the fields from the two point sources.

The total power (300 watts) is split equally between the two sources, and the total radiated field power density is set equal to the C95.1 standard (1 mwatt/sq. cm.) The distance corresponding to this power level can then be calculated. The spacing in the vertical direction is 116 cm from the feed point and in the horizontal direction the spacing is 2.1 meters.

These prior calculations take into account the radiated field and the distances arrived at are very close to the antenna. Close to the antenna there is also a reactive field which is very complex and decays rapidly with distance. At a distance of 2 wavelengths, the reactive field has about one percent of the energy of the radiated field, and is probably not a very significant factor beyond one wavelength. In the example dipole, one wavelength is 2 meters, so the previously calculated vertical spacing is probably overstated; an actual measurement would be the surest method to determine spacing. Note that for higher frequencies, the wavelength is shorter and the radiated field spacing will be a sufficient criterion.

As can be seen from the above, which is based upon practical Land Mobile base station installations, the requisite spacings are considerable less than those indicated by the Commission. TIA believes that its spacing requirements more accurately reflect the Land Mobile environment than those provided by the Commission.

IX. The FCC Should Initiate a Further Proceeding to Clarify Federal Preemption Rules.

The NPRM affords a legal basis for these rule changes and cites the Commission's legal obligations under the NEPA, 42 U.S.C. Section 4321, et seq. (1976) and the Communications Act of 1934 at 4(i), 4(j) and 303(r). Based on the authority vested in these Acts, the TIA believes the Commission has authority to promulgate such rule changes and TIA intends to participate in the development of these rules. Nonetheless, the TIA would like the Commission to validate that the Commission will be the sole promulgator of rules relating to this NPRM. Any additional or different rules created by the States, FDA, NTIA, EPA, OSHA, FAA, NCRP or any other regulatory or legislative body, would have to be harmonized with the requirements specified by the Commission. [16] [17]

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[16] TIA is concerned that states such as California, and possibly other regulatory functions, may enact EMF policy and regulations which are incompatible with the Commission's policy and regulations. For example, in 1991 the California Public Utilities Commission issued an Order instituting an investigation into the potential health effects from Electric and Magnetic Fields emitted from electric power and cellular telephone facilities. As a result of this action, the California EMF Consensus Group has been activated and has submitted its recommendations to the CPUC. Funding will come from the California public utility customers. Recently, an EMF Consensus Group member noted that "by combining existing California Department of Health Services, California Department of Education and electric utility EMF programs...[and the funding from the utility customers]...California will have a comprehensive and coordinated response to EMF issues."

[17] In addition, the Commission's OET Bulletin No. 56, noted that "Local or state RF standards have been established or proposed in Oregon, Washington, Massachusetts, New York and New Jersey. Many of these standards are more restrictive than the 1982 ANSI standard for exposure of the general public." See OET/FCC "Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Radiation" (January 1989) at p.9.

As manufacturers of radio emitters, we are willing to certify our products to meet "a" logical specification. Notwithstanding, the requirement for RF products to meet "numerous" specifications is not in the public interest and only serves to needlessly inflate the user's cost of radio communications equipment. Thus, the TIA respectfully requests that the Commission initiate a further proceeding to clarify that the rules it promulgates will be the sole requirement for equipment as it relates to environmental effects of RF exposures on humans.

X. Conclusion

TIA wishes to reiterate that the data on the subject of RF exposure in the land mobile community simply does not show any need for action towards correction of a real or even a perceived problem. By accepting TIA's recommendation to address the RF level certification via the type acceptance procedures, the user risks will not have been compromised, while at the same time the Commission will have avoided the potential for inadvertently creating market or user disruption due to the misapplication of the C95.1 requirements to the land mobile environment.

Respectfully Submitted,

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